CASE REPORT

TRAUMA AND RECONSTRUCTIVE UROLOGY

A case of polytrauma with splenic rupture and complete left renal artery avulsion

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This study presents a case of avulsion of the left renal artery from the aorta and splenic rupture after blunt abdominal trauma accompanied by an extensive crush syndrome. Based on contrast–enhanced abdominal ultrasound and computed tomography CT, the patient was qualified for urgent surgical intervention with removal of the injured kidney and spleen.

Key Words: polytrauma ‹› renal trauma

INTRODUCTION

Kidney injuries following blunt abdominal trauma in humans are described in 3–10% of cases [1, 2]. The most common cause of blunt renal trauma is the mechanism of rapid kidney deceleration, which occurs in motor vehicle accidents, falls from height, or on a direct impact in the lumbar area. These may result in damage to the kidney, which is classified on the basis of diagnostic imaging and exploratory surgery as grade I to V, according to a scale developed by the American Association for the Surgery of Trauma (AAST). After this scale, the most severe type of kidney injury is its fragmentation or vascular pedicle avulsion from the main renal vessels with the interruption of renal blood flow (grade V injury) [3].
Among the atypical kidney injuries reported are: a complete avulsion of the renal pelvis from the kidney with its main blood supply maintained [4], avulsion of the renal pelvis with the renal calyxes from the renal hilum, pedicle avulsion accompanied by spleen rupture [5], post–traumatic spleen rupture with concurrent pedicle avulsion, as well as cases of renal vascular pedicle avulsion in animals as a result of blunt abdominal trauma in a traffic accident [6].
Grade V renal injury is regarded as life–threatening, requiring urgent surgical intervention. If renal injury is accompanied by another abdominal organ injury, a wide transperitoneal approach for surgical procedure is the treatment of choice.
The authors present a case of blunt abdominal trauma with subsequent rupture of the spleen and avulsion of the left renal artery from the aorta.

CASE STUDY

A male patient aged 29 years was admitted to the Hospital Emergency Department (SOR) of the Hospital Trauma Centre WSS5 in Sosnowiec in serious condition following a massive multiorgan injury after being crushed by a large block of coal in a mine. The patient was unconscious, in oligovolemic shock – his state was unstable. Basic blood tests showed Erythrocytes 2.19 10^12/liter, Hemoglobin 5.2 grams/liter, Hematocrit 21.3%, PLT 125 thousand, Na 143, K 6.7, Creatinine 27.36 mmol/liter, urinalysis revealed pH 5, SG 1.010, leukocytes 0, and

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erythrocytes single/LPF. The arterial blood pressure ranged from 70/50 to 110/80 mmHg and the pulse rate from 90 to 115/min.

After controlling the shock and stabilizing the vital functions by transfusion of sufficient amount of colloid solutions, crystalloids, and erythrocyte mass, a left pleural cavity drain was made because of emphysema. Then a full body contrast–enhanced CT scan was performed, which revealed fluid of the density of 40 HU – extravasated blood – in the abdominal subphrenic area and around the lower edge of the liver; no injuries to the right kidney; a lack of contrast of the injured left kidney in the arterial phase, no cortex enhancement; the left renal artery visible only in the proximal section, not contrasted in the farther section (Figure 1). A small amount of extravasated blood around the left kidney, and much grater amount around the spleen was visible. Within the central part of the spleen a visible part of uncontrasted parenchyma suggested a rupture gap.

It was decided to carry out a laparotomy. The opening of the peritoneal cavity by a median incision revealed the presence of 1,000 ml of blood and a longitudinal rupture of the spleen, which was removed. On palpation of the retroperitoneal space a small hematoma was found on the left side. After a posterior lamina incision and kidney dissection, its significant pallor was noted with no signs of renal parenchyma damage. A pedicle dissection revealed the pararenal stump of the renal artery and the intact renal vein. The para–aortic stump of the artery was not revealed. Vascular clamps were put on the left renal vein, the ureter was ligated and the kidney was removed. The para–aortic stump of the renal artery was rotated back from the aorta, shrunken and bleeding, and it was therefore ligated. The patient was transferred to the Intensive Care Unit (ICU). In the following days, due to increasing signs of renal failure and metabolic acidosis, the patient underwent several hemodialyses. The patient was discharged home in a good condition fifty–five days after the trauma.

Figure 1. *A lack of contrast of the injured left kidney in the arterial phase.*

DISCUSSION

Injuries to the main trunk of the renal artery or its large branches constitute 2.5–4% of the blunt renal trauma incidence [7]. These injuries are frequently accompanied by damages to other abdominal organs. The estimated mortality rate in such cases is 19–44% [2]. In the case described herein, the complete interruption of the left renal artery was accompanied by the splenic rupture.

Most authors are of the opinion that the conservative treatment of isolated injuries of large renal vascular trunks should be applied in specific cases and is related to a very high risk of massive bleeding [8]. As described by Elliot et al. of 81 cases of major and segmental renal arterial injuries, conservative treatment was used only in two patients [9]. Concomitant damage to any abdominal organ is an indication for urgent open surgery. In such cases the kidney removal is performed, however, some authors describe corrective surgeries of the damaged renal vessels, underlining that the postoperative recovery of these patients is worse. The effect of revascularization after blunt trauma, leading to the interruption of the renal artery is worse than in the case of revascularization after a sharp vessel cut. The authors suggest that after blunt trauma, damage to the endothelium leads to thrombosis [9]. Such thrombosis was observed by the authors who have described renal blunt trauma and renal artery avulsion in a dog [6].

In the case presented herein, on the retroperitoneal revision, the para–aortic section of the stump of the renal artery did not bleed, probably due to resulting thrombosis. This mechanism explains why such a serious injury, that is, a complete interruption of the main trunk of the renal artery did not lead to the death of the patient. Czyżak et al report two cases of renal pedicle injury, which were treated conservatively. One of these patients underwent necrotic kidney removal two months after the injury. The second patient was operated on the fourth day after the injury, which revealed the presence of a perirenal hematoma. The para–aortic stump of the renal artery was not found, and the kidney was removed following ligation of the renal vein [10].

An assessment of the appropriate type of renal injury is crucial in deciding the treatment. The widely used I–V AAST classification refers to a diagnosis based on imaging studies and intraoperative assessment of the kidney. Federle's classification distinguishes four grades of renal injury, wherein grade IV corresponds to grades IV and V of the AAST scale [11].

In our case we have relied on the AAST scale, categorizing this type of injury as the interruption of the continuity of at least one of the structures of the renal hilum with its total ischemia (grade V). It was decided, therefore, to explore the retroperitoneal space and thoroughly search for the confirmation of the diagnosis made on the basis of CT. During the exploration of the kidney its pallor accompanied by a small hematoma in the retroperitoneal space and the absence of any damage to the renal parenchyma were observed. However, there is justifiable fear that without the initial diagnosis made on the basis of CT, such a serious injury as a complete interruption of the continuity of the artery could be overlooked during the routine inspection of the retroperitoneal space, as has been pointed out by Czyżak et al. [10].
Contrast–enhanced abdominal computed tomography remains the primary diagnostic examination of abdominal trauma. It allows for indicating the exact location and type of the injury to all the abdominal organs, including the kidneys. The lack of contrast enhancement of the kidney is a pathognomonic indication of vascular pedicle injuries. When one kidney is damaged, the assessment of the functional status of the other kidney helps decide about the choice of suture of the injured kidney.

In blunt trauma, especially in falls from height, renal pedicle concussion can occur, without interrupting the continuity of blood vessels. This results in a reflex contraction of the renal artery, which in the radiographic imaging (CT, urography) is displayed as an inactive kidney, suggesting extensive renal injury, including damage to the kidney pedicle. In this type of isolated injury, a patient's clinical condition is good, and the kidney imaging repeated after a few hours shows a normal kidney. In polytrauma, patients are usually unstable. Doppler ultrasound should be used as a valuable tool in the diagnosis of renal vascular trauma.
In life–threatening hemodynamic cases requiring urgent surgical intervention, an intravenous contrast dose of 2 ml/kg and X–ray after 10 minutes allows for making a decision as to the type of intervention [12]. Unstable patients who require emergency surgical exploration should undergo one–shot of IVP with bolus intravenous injection of 2 mL/kg contrast.

CONCLUSIONS

During renal exploration at laparotomy, special attention should be paid to the color of the renal parenchyma, not merely to the damaged parenchyma, or the condition of the upper urinary tract.

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